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ROYAL ASTRONOMICAL SOCIETY.

Vol. VIII. *February* 11, 1848. No. 4.

Sir John F. W. Herschel, Bart., President, in the Chair.

The following Report was presented by the Council:—

Report of the Council to the Twenty-eighth Annual General Meeting.

In commencing their Twenty-eighth Annual Report, the Council feel they can truly state that few occasions of the kind have afforded them more satisfaction. The matters on which they have to report will, they have no doubt, speak for themselves in terms which will produce the same feeling in this Meeting.

The Report of the Auditors, subjoined, will shew the state of the finances:—

RECEIPTS.

	£	s.	d.
Balance of last year's account	188	0	3
1 year's dividend on £900 Consols	26	4	4
1 ditto on £2272 7*s.* 4*d.* New 3¼ per Cents	71	14	0
On account of arrears of contributions	50	8	0
79 contributions (1847–48)	165	18	0
2 ditto (1848–49)	4	4	0
2 compositions	42	0	0
13 admission fees	23	2	0
11 first year's contributions	14	14	0
Sale of Memoirs	54	14	6
	£640	19	1

EXPENDITURE.

				£	s.	d.
Cash paid for Investment of 1 composition				21	0	0
Mr. Barclay, for printing Memoirs				180	5	3
Ditto for printing Monthly Notices				97	4	11
Taxes: Land tax and window duty, 4 quarters	8	7	3			
Taxes: Income and property tax, 4 quarters	1	9	2			
				9	16	5
J. Williams, for 1 year's salary as Assistant-secretary				100	0	0
Ditto commission on collecting £313 10*s.* 6*d.*				15	13	6
Carried forward				£424	0	1

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EXPENDITURE (*continued*).

	£.	s.	d.
Brought forward	424	0	1
Charges on books, and carriage of parcels	3	1	7
Postage of letters	17	7	8
Porter's and charwoman's work	10	17	4
Tea, sugar, cakes, &c. for evening meetings	13	12	0
Coals, candles, &c.	12	18	6
Sundry disbursements by the Treasurer	27	3	2
Balance in the hands of the Treasurer (26th Jan. 1848)	131	18	9
	£640	19	1

The assets and present property of the Society are as follows:

							£	s.	d.
Balance in the hands of the Treasurer							131	18	9
3 contributions	of 9 years' standing		£56	14	0				
3 ———	of 8	ditto	50	8	0				
4 ———	of 7	ditto	58	16	0				
1 ———	of 6	ditto	12	12	0				
1 ———	of 5	ditto	10	10	0				
6 ———	of 4	ditto	50	8	0				
2 ———	of 3	ditto	12	12	0				
7 ———	of 2	ditto	14	14	0				
21 ———	of 1	ditto	44	2	0				
							310	16	0

£900 3 per Cent Consols.
£2272 7*s*. 4*d*. New 3¼ per Cent Annuities.
Unsold Memoirs of the Society.
Various astronomical instruments, books, prints, &c.

The stock of volumes of the *Memoirs* still in the Society's possession is as follows:—

Vol.	Total.	Vol.	Total.	Vol.	Total.
I. Part 1	50	IV. Part 2	178	XI.	261
I. Part 2	95	V.	193	XII.	274
II. Part 1	114	VI.	212	XIII.	296
II. Part 2	80	VII.	238	XIV.	480
III. Part 1	140	VIII.	224	XV.	278
III. Part 2	160	IX.	232	XVI.	340
IV. Part 1	165	X.	249		

It has been judged expedient that this account of the stock of *Memoirs* on hand should in future form part of the Annual Report. It will be seen that the number of complete sets still remaining is not large, and the Council will soon have to take into consideration the propriety of stopping the sale of the earlier volumes. It is obviously desirable that some sets should remain with the Society, for presentation to such important astronomical institutions as may be founded from time to time.

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The progress and present state of the Society, with respect to Fellows and Associates, is as follows :—

	Compounders.	Annual Contributors.	Non-residents.	Patroness, and Honorary.	Total Fellows.	Associates.	Grand Total.
February 1847	123	127	73	5	328	37	365
Since elected	1	8	...	...	...	...	9
Deceased	−3	−2	−1	−2	...	−1	−9
Resigned	...	−1	...	...	...	...	−1
Removals	...	...	...	...	...	...	...
February 1848	121	132	72	3	328	36	364

The instruments belonging to the Society are now distributed as follows :—

The *Harrison* clock,
The *Owen* portable circle,
The *Owen* portable quadruple sextant,
The *Beaufoy* circle,
The *Beaufoy* transit,
The *Beaufoy* clock,
The *Herschelian* 7-foot reflector,
The *Greig* universal instrument,
The *Smeaton* equatoreal,
The *Cavendish* apparatus,
The Universal quadrant by Abraham Sharp,
The 7-foot Gregorian reflecting telescope (late Mr. Shearman's),

are in the apartments of the Society.

The brass quadrant, said to have been *Lacaille's*,

is in the apartments of the Royal Society.

The Standard scale

is in the charge of the Astronomer Royal, with the consent of the Council, to be employed in the formation of a new Standard Measure, under the direction of the Standard Committee.

The *Lee* circle

is now in the hands of Mr. Simms for some repairs, preparatory to its being returned by Lord Wrottesley.

The remaining instruments are lent, during the pleasure of the Council, to the several parties undermentioned, viz.:

The *Fuller* theodolite, to the Lords of the Admiralty.
The other *Beaufoy* clock,
The two invariable pendulums, } to the Royal Society.
The *Wollaston* telescope, to Professor Schumacher.
The Variation transit (late Mr. Shearman's), to Mr. J. Rees.

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The sixteenth volume of the *Memoirs* has now been published for some time, and the seventh volume of the *Monthly Notices* is also completed. The Fellows will have observed that, for many months past, the *Monthly Notices* have assumed a new and more active character. They have always been effective as a record of the proceedings of the Society, a precursive abstract of all that is in the *Memoirs*, and a place of deposit for much valuable matter which, from its temporary character, could not properly find a place in the larger volumes. But they have lately been something more, inasmuch as they have been employed in calling the attention of astronomers, and particularly of observers, with more both of minuteness and extent, to points of instant importance. For the suggestion of this change, and its conduct hitherto, the Society is indebted to the Rev. R. Sheepshanks, whose services the Council have so often to acknowledge.

The memoir on the longitude of Valentia, which contains an account of operations carried on by the Astronomer Royal for the Admiralty, is printed at the expense of the Government, and by the Government printer. This will explain the difference of type, particularly as regards the numerals, which are of the modern form, while those in the rest of the volume are of the ancient character, of which the Council has done its best to promote the restoration.

The paper by Mr. Adams, "On the Perturbations of *Uranus*," appears in this volume, for which it was originally intended, though, owing to the well-known circumstances which attended its promulgation, the offer of Mr. Stratford to print it as a supplement to the *Nautical Almanac for* 1851 was accepted. To the energetic manner in which Mr. Stratford followed up his proposal, and the personal exertion which he used (greatly as we believe to the satisfaction of the Board of Admiralty), the Council was indebted for the opportunity which was afforded to its Members of seeing Mr. Adams's investigations in detail before they proceeded to their deliberations of January in last year. As circumstances connected with first publication are often misunderstood by lapse of time, it may be as well here to record that this supplement to the *Nautical Almanac for* 1851 was really printed and circulated at the very beginning of last year, though the *Almanac* itself (with its supplement still attached) only made its appearance about a month ago.

In the final superintendence of this volume, the Society is under much obligation to Mr. Galloway, whose acceptance of the Secretaryship this time last year was mainly due to his sense of the difficulty in which the Society might be placed, if a duty which unavoidable circumstances had rendered more than usually pressing were at once to pass into hands unused to its routine. The Council regret to add, that they lose the services of Mr. Galloway in this capacity; but they think the Meeting will feel with them that the presence in the Council of so many persons who have learnt how to serve the Society in the post of Secretary is a very encouraging circumstance, and a guarantee for the effective transaction of its business.

In the Annual Report of last year, intimation was given that the *Monthly Notices* would be considerably modified, and would, in future, include a larger portion of the communications addressed to the Society than had thitherto been usual; and the Fellows are now in a situation to judge of the advisableness of the course pursued. It is hoped that the increased expense of the *Notices* will be more than compensated by the corresponding contraction of the *Memoirs*, and that more complete and more interesting matter will be thus presented gratuitously to the Fellows. It is proposed to print all short memoirs, all observations, all matters of immediate interest, and accounts of inquiries which are in progress, with such details as more directly concern the Society itself, in the *Monthly Notices*, reserving the larger memoirs, and more finished results, for the quarto volume. There will, at times, of course be some difficulty in classing the memoirs; but care will be taken that the general rule of finding a place for every communication of value, and of printing very little twice over, shall be, on the whole, observed.

The Council have directed that the *Monthly Notices* shall be collected and published as a *part* at the end of every session, and that a volume of the *Memoirs* shall also be pnblished annually. The two publications are to be considered as members of the same work, each imperfect without the other.

At present, an attempt to introduce something like uniformity gives a good deal of trouble: very much requires to be re-copied, a loss of labour which would be spared, if contributors would either follow carefully the types already set forth, or would furnish other forms still more complete and adapted to an octavo page. Some errors, too, would thus be avoided, and the printer's charge for corrections be greatly lessened.

The ephemerides of the newly discovered planets have been mostly supplied by Mr. Hind and Mr. Adams. It is not possible that Mr. Hind should continue to render such services to the Society as he has done during the past year, with due regard to himself and to the South Villa Observatory. Yet it is impossible that amateur observers, or even the directors of our public observatories, should be able to follow recently discovered planets, or comets, without at least an *approximate* ephemeris. Here is, then, a task which would be very useful when performed, and in which many of our members could assist. If the Society is to furnish means of observing the recently discovered bodies until they are inserted in the *Nautical Almanac* (and in few ways can it act more beneficially), we must press more amateur computers into the service. Is it too much to ask of the zealous cultivators of astronomy who are with us to-day, bodily or in good will, that they would, so far as they are able, lend their hearty co-operation to this good work? A cursory glance over the recent numbers of the *Notices* will shew what has been effected by a moderate degree of organisation and method, and what may be expected from more vigorous measures. There is a powerful observing force in this kingdom (a force greatly on the increase), competent to contend with the most difficult objects, and directed by zealous observers. It is for this Society to furnish some of the aids most needed, and to assist in seizing the proper points of application. Nor is our power to help and encourage limited to this country alone. Gratified as we may be with the successful exertions of our corporation and its individual members up to the present time, there is great scope for increased exertion. So extensive, indeed, and varied is the science of astronomy, that any sensible and zealous man may contribute to its progress or its perfection in some way or other, and we may confidently assert that such endeavours would be encouraged and justly valued by the Royal Astronomical Society.

It has been thought advisable to postpone the printing of the Library Catalogue until it should be seen how far the finances of the Society would allow of the additional expense attending a complete, and now not a small, Catalogue. The funds of the Society, though, under proper management, they do not prove inadequate to its ordinary purposes, will not allow of much additional expenditure.

In consequence of the continued neglect of several of the Fellows to pay the arrears due to the Society, notwithstanding repeated notice given, and the suspension of their names in the meeting-room, agreeably to the Bye-laws, the Council has found it necessary to summon a Special General Meeting (to be held at the close of the present meeting), for the purpose of expelling these defaulters from the Society.

Among the personal losses of the Society we have to notice the deaths of two of our Honorary Members, His Majesty the King of Denmark and Miss Caroline Herschel; as well as those of six of our Fellows, Dr. Dealtry, Captain Grover, Dr. Meikleham, Dr. Pearson, Admiral Shirreff, and the Rev. W. Slatter.

Christian VIII. King of Denmark, Duke of Schleswig, Holstein, and Lauenburg, was born Sept. 18, 1786. He succeeded his cousin Frederic VI. Dec. 3, 1839, and died at Copenhagen on Jan. 20, in the present year.

On his accession to the throne, he afforded the same liberal patronage to Astronomy which had distinguished his predecessor: this quality, indeed, seems to be almost hereditary in the house of Denmark. The *Astronomische Nachrichten*, a publication which perhaps has done more than any thing else to extend and perfect the science during the last quarter of a century, was maintained by him on its original footing, and, with great judgment, he specially directed Professor Schumacher* to continue his residence at Altona,—a station better suited to an observatory than the capital, and singularly proper for maintaining an active correspondence with a large

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* Professor Schumacher's residence at Altona, besides giving admirable facilities for collecting and distributing intelligence, enables him to act as a channel of communication between Continental Germany and the kindred countries of England and America. This Society has had frequent occasion for the Professor's assistance; and it is given with a readiness which doubles the obligation.

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part of the civilised world. He continued, too, the grant of a gold medal to the first discoverer of every telescopic comet; and it is to the zeal thus excited we owe the immense advances which have been made within the last few years in the detection, observation, and calculation of these interesting bodies. An arc of the meridian, which is now in progress, and which is to be carried to Skagen (the northern point of Jutland) was also an object of his munifience. Some time ago, when Professor Hansen had investigated a theory of the moon by methods of his own, the King ordered that the theory should be reduced to tables at his expense. From the progress already made, this valuable and original work may be expected to be completed in about four years, if the funds be continued.

It will be admitted that these are no common claims to the respect of astronomers; and Christian VIII. shewed by undoubted tokens that his patronage of science was a labour of love. He took an interest in its progress, and was anxious to have early information of every new discovery; it was by his own wish that Professor Schumacher corresponded with him on astronomical subjects.

Though it would not become us to enter into political questions, we should scarcely do justice to this accomplished Prince if some mention were not made of his varied tastes and acquirements: geology, mineralogy, conchology, antiquities, and the fine arts had each a share in his attention. His private collection of minerals and shells excited the liveliest admiration among connoisseurs at the meeting of German philosophers in 1846. While in Italy, he ascended Vesuvius, during an eruption, accompanied by Sir Humphrey Davy, and published his observations on the lavas of that mountain in the *Memoirs of the Academy of Sciences of Naples.** He formed about the same time a fine collection of Etruscan vases, purchasing those belonging to the Archbishop of Tarento, and adding to them as opportunities offered. In the *Antiquarian Annals* he gave an account of "*Ancient Relics and Antiquities found at Bornholm.*"† There is also in print a speech which he delivered as President at the Inauguration of the University of Christiana (Dec. 11, 1811). As Prince Royal he presided over the Academy of Arts; and his refined taste and accurate judgment were universally recognised and admired.

Under the title of Protector, he was, while King, President of the Danish Academy of Sciences; and the meetings of that body were held not unfrequently at the Palace, and in his presence.

We are told by one well qualified to judge, that the King's affability greatly enhanced the value of his solid encouragement. Sometimes, indeed, his regard for personal talents and scientific acquirements led him into a pardonable deviation from court etiquette. Shortly before his death, he added, with his own hand, the names of Professors Oersted and Schumacher to the Grand Crosses of the Danebrog—an honour perhaps never before conferred on a professor —saying that he felt great pleasure in being thus able to prove that he considered literary and scientific merit as not inferior to that of any other kind.

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* *Osservazioni sulla Lava del Vesuvio del 26 Gennajo,* 1820. *Memoria di S.A.R. il Principe Christiano Federico di Danimarca, Socio Onorario dell' Academia delle Scienze di Napoli.* Napoli, 1820, 4to.

† Vol. iv. 1827, p. 379, *et seq.*

Christian VIII. is succeeded by his son Frederic VII., born Oct. 6, 1808.

On the subject of Miss Herschel's astronomical career, the Council feel that they cannot do better than insert, with some additions, an account contributed by our President to a literary journal,* on the recent occasion of her death. The Council always endeavour to procure biographical notices in the most authentic form, and from the most unquestionable sources; and not generally feeling at liberty to alter the words of communications so received, they begin by giving the above-mentioned communication entire.

Miss Caroline Lucretia Herschel died at Hanover on the 9th of January, in the ninety-eighth year of her age. She was the fourth daughter of Isaac Herschel and his wife, Anna Ilse Moritzen, and sister to the celebrated astronomer of that name, as well as the constant companion and sole assistant of his astronomical labours, to the success of which her indefatigable zeal, diligence, and singular accuracy of calculation, not a little contributed. She was born† in Hanover on the 16th of March, 1750; where she resided under the parental roof till her twenty-second year—when she joined her brother, then actively engaged in the musical profession at Bath, in England, a country which was destined to be her home for half a century. There, from the first commencement of his astronomical pursuits, her attendance on both his daily labours and nightly watches was put in requisition; and was found so useful, that on his removal to Datchet, and subsequently to Slough—he being then occupied with his reviews of the Heavens and other researches—she performed the whole of the arduous and important duties of his astronomical assistant,—not only reading the clocks and noting down all the observations from dictation as an amanuensis, but subsequently executing the whole of the extensive and laborious numerical calculations necessary to render them available to science, as well as a multitude of others relative to the various objects of theoretical and experimental inquiry in which, during his long and active career, he at any time engaged. For the performance of these duties His Majesty King George the Third was graciously pleased to place her in the receipt of a salary sufficient for her singularly moderate wants and retired habits.

Arduous, however, as these occupations must appear,—especially when it is considered that her brother's observations were always carried on (circumstances permitting) till day-break, without regard to season, and indeed chiefly in the winter,—they proved insufficient to exhaust her activity. In their intervals she found time both for actual astronomical observations of her own, and for the execution of more than one work of great extent and utility.

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* The *Athenæum* of January 22.

† This is 1750 as then called in Germany, where the new style was established. Had it been the English date of that name, it must have been now rendered by 1751.

The observations here alluded to were made with a small Newtonian sweeper, constructed for her by her brother; with which, whenever his occasional absences or any interruption to the regular course of his observations permitted, she searched the Heavens for comets,—and that so effectively as on no less than eight several occasions to be rewarded by their discovery (viz. on Aug. 1, 1786; Dec. 21, 1788; Jan. 9, 1790; April 17, 1790; Dec. 15, 1791; Oct. 7, 1793; Nov. 7, 1795; and Aug. 6, 1797). On five of these occasions (recorded in the pages of the *Philosophical Transactions* of London) her claim to the *first* discovery is admitted. These sweeps, moreover, proved productive of the detection of several remarkable nebulæ and clusters of stars previously unobserved: among which may be specially mentioned the superb Nebula, No. 1, Class V. of Sir William Herschel's catalogues—an object bearing much resemblance to the celebrated nebula in *Andromeda*, discovered by Simon Marius—as also the Nebula V, No. 18; the 12th and 27th clusters of Class VII.; and the 45th, 65th, 72nd, 77th, and 78th, of Class VIII. of those catalogues.

The astronomical works which she found leisure to complete were: 1st. *A Catalogue of* 561 *Stars observed by Flamsteed*, but which, having escaped the notice of those who framed the *British Catalogue* from that astronomer's observations, are not therein inserted: 2nd. *A General Index of Reference to every Observation of every Star inserted in the British Catalogue.* These works were published together in one volume by the Royal Society; and to their utility in subsequent researches Mr. Baily, in his *Life of Flamsteed*, pp. 388, 390, bears ample testimony. She further completed the reduction and arrangement as a *Zone Catalogue* of all the nebulæ and clusters of stars observed by her brother in his sweeps: a work for which she was honoured with the Gold Medal of the Astronomical Society of London, in 1828,—which Society also conferred on her the unusual distinction of electing her an Honorary Member.

On her brother's death, in 1822, she returned to Hanover, which she never again quitted,—passing the last twenty-six years of her life in repose, enjoying the society and cherished by the regard of her remaining relatives and friends, gratified by the occasional visits of eminent astronomers, and honoured with many marks of favour and distinction on the part of the King of Hanover, the Crown Prince, and his amiable and illustrious consort.

To within a very short period of her death her health continued uninterrupted, her faculties perfect, and her memory (especially of the scenes and circumstances of former days) remarkably clear and distinct. Her end was tranquil and free from suffering—a simple cessation of life.

So far the account in question. Besides the tributes mentioned

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in it as paid to her, it may be added that she was elected a Member of the Royal Irish Academy, and presented with a gold medal by the King of Prussia, as an acknowledgment of her astronomical services. From H. R. H. the Duke of Cambridge, when Viceroy of Hanover, she received great kindness and attention. At her funeral, which took place on the 18th of January, the coffin was adorned with palm branches by order of the Princess Royal, and followed by a royal carriage. Her memory will live, with that of her brother, as long as astronomical records of the last and present century are preserved; and it will live on its own merits, even though, as may reasonably be hoped, the time should come when the astronomical celebrity of a woman will not, by the mere circumstance of sex, be sufficient to excite the slightest remark. It must be matter of congratulation that she survived to see the enormous undertaking commenced by her brother extended and perfected by her nephew.

Dr. Dealtry's life is written at length in the theological periodicals, and the greater part of it was passed in the active duties of a parish priest, only varied by efforts to promote various objects of religious association. He was of Trinity College, Cambridge, and took his degree of Bachelor of Arts, being Second Wrangler, in 1796, and proceeded Doctor of Divinity in 1829. He is known to the mathematical world by his work on Fluxions, the last of any note which preserved that name and its attendant symbolic notation. This work ranks high among its class. The first and second editions were in 1810 and 1816, and there is a third comparatively recent.

Captain John Grover was descended from a family in Hertfordshire. He entered the army on August 12th, 1812, as ensign in the 12th Regiment. While on his way to join the forces in Belgium, shortly previous to the battle of Waterloo, the transport which conveyed him was shipwrecked on the coast of Holland, and on this occasion it is recorded of him that he did not leave the vessel till the safety of every individual under his authority was fully secured. Though too late for the battle of Waterloo, he was present at the capitulation of Paris.

He was promoted to the rank of Captain in 1826, from which period he remained on half-pay; but though he did not pursue the path of active military service he was not idle, and he employed the resources of his private fortune in pursuits congenial to his tastes —in cultivating natural history and science: he employed also nearly three years in the study of jurisprudence, and other subjects, at the University of Bologna.

In 1843, the uncertain fate of his friend Colonel Stoddart, and of Captain Conolly, two officers who had gone on a diplomatic mission to the court of Bokhara, and who were reported to have been murdered, caused him great anxiety, and he determined to employ every effort, either to restore them from captivity if they were yet alive, or to ascertain the particulars of their death. Captain Grover was desirous to proceed at once himself to the scene of their captivity, and he applied to Her Majesty's Government for their permission or countenance to his travelling as a British officer. As, however, they declined to recognise him in any other position than that of a private traveller, and as he deemed some further protection indispensable in an enterprise of peculiar delicacy and hazard, he was obliged to decline the undertaking.

About the same time the Rev. Joseph Wolff, who had travelled in Bokhara and adjacent countries some years before, likewise entertained doubts of the reports in circulation respecting the death of Colonel Stoddart and Captain Conolly, the latter of whom was his particular friend, and resolved to proceed in person to set the question at rest. He obtained from Government the assistance that he required in letters and introductions, and set out on his journey with the confidence founded on his knowledge of the countries and people he had to pass through, and his personal acquaintance with individuals of high rank in Bokhara, and also on the respect which he knew would, in general, be paid to a minister of religion.

In the meantime Captain Grover made every exertion in England to forward the success of the enterprise, and proceeded to St. Petersburgh in order to acquire such information as the Russian Government might afford him, and, if possible, to obtain their cooperation. The object of Dr. Wolff's journey, in obtaining a circumstantial account of the fate of the prisoners, was not indeed fully effected, but no doubt remained that they had been treacherously put to death. Dr. Wolff himself was, as related in the account of his journey, made prisoner by the Khan of Bokhara, and was in great danger of his life.

The unceasing exertions of Captain Grover, and his anxiety, while any hope remained, for the safety of his friend, appear to have been too much for his constitution; he lost his voice, and his strength declined somewhat rapidly until his death, which took place at Brussels on Nov. 6, 1847, in the 51st year of his age.

Captain Grover was a man of very active habits, of benevolent disposition, and of extraordinary perseverance of character. From his taste for arithmetic and habits of order he had been from a very young officer charged with the accounts of the detachment of his regiment which he accompanied. He was a member of several scientific societies, and a constant attendant at their meetings.

Captain Grover was married about 1831, and has left an only daughter.

Rear-Admiral Shirreff was a son of the late General Shirreff, and gained the first rudiments of his education in Westminster School. Here, however, his continuance was short, for, having evinced a strong desire for sea life, he was entered on board La Juste, of 80 guns, as a first-class volunteer, in 1796, being then in the 12th year of his age. From this ship he was discharged during the mutiny of the following year; and he afterwards served his probational time as midshipman and master's mate, successively in the Princess

Royal, Neptune, Circe, Stag, Romney, Magnificent, and Reynard. In these ships he was in very active service, and employed on various harassing duties, especially at the blowing up of the sluices at Ostend, the cutting out of many vessels, and the assisting Sir David Baird's army in the Red Sea. While on board the Stag frigate, then commanded by the late Admiral Winthrop, a Fellow of this Society, she was unfortunately wrecked in Vigo Bay; and the Magnificent, of 74 guns, of which he was master's mate, was totally lost on the Black Rocks, near Brest, when he narrowly escaped being made a prisoner.

On the 3rd of March, 1804, Mr. Shirreff was promoted to the rank of lieutenant, in which situation having served two years, he was advanced to that of commander; and in these posts he served four years in the West Indies with great zeal and credit. As captain of the Lily sloop of war, he acquired the public approbation of his admiral by his conduct at the capture of Deseada, and his protection of it afterwards.

Captain Shirreff was posted into the Garland, of 22 guns, on the Jamaica station, on the 15th of November, 1809. His next appointment was in October, 1812, to the Barossa, a new 38-gun frigate, in which ship he proceeded to North America, where he was actively employed till the conclusion of the war; when, being paid off, he passed a few years with his wife and family. In the autumn of 1817, however, he was called upon to commission the Andromache, of 44 guns, for the South American station; and he remained nearly four years senior officer in the Pacific Ocean, where his upright demeanour greatly forwarded the interests of British commerce in very troublous times. While thus employed, he at his own risk freighted a small vessel, and sent her with his barge, under the command of Mr. Edward Bransfield, master of the Andromache, to examine and survey certain lands reported to have been seen to the southward of Cape Horn; and to this voluntary responsibility we owe the correct appearance of South Shetland on the charts.

Returning home from South America in August 1821, Captain Shirreff retired to domestic life; and having joined this Society, then newly formed, he became much interested in its objects, insomuch that he built and equipped a small private Observatory, the principal instruments being a clock, a portable transit, a 12-inch altitude and azimuth circle, and a 5-foot telescope. He had ever been very attentive to nautical astronomy, and was what is called among naval officers a smart lunarian. From these pursuits he was diverted in January 1829, by his appointment as flag-captain to Rear-Admiral Baker, the commander-in-chief on the South American station, whose flag was hoisted on board the Warspite, 74. Finding, however, the season very trying to his health, he invalided, and returned to England in 1830.

After a short repose, his health being fully restored, he again sought active employment, and was Captain of the Port at Gibraltar for seven years and a-half; and such was the insight which he gained of Spanish interests, that he was sent on a confidential

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mission to Madrid by Lord Palmerston, to aid in fixing the foundation of a new commercial treaty. While at the Rock, he kept an observatory at his own expense, for the purpose of giving the exact time to shipping; and owing to his earnest recommendation, a light-house was erected on Europa Point. He was recalled to England, and appointed Captain-Superintendent of Deptford Dockyard, where he remained from April 1838, to August 1841; during which period he was usefully employed in carrying strict economy into that establishment. When the Astronomer Royal instituted his successful experiments on iron-built ships, for the purpose of discovering a correction for the deviation of the compass produced by the iron of the ships, Captain Shirreff rendered such cordial co-operation, that in the admirable memoir of the proceedings published in the *Philosophical Transactions* for 1839, Mr. Airy thus expressed himself:—"To all the persons named above my cordial thanks are due for the zeal and steadiness with which they followed out my plans under the most distressing circumstances of weather. But to Captain Shirreff in particular an acknowledgment of my obligations must be here given. Not only was the assistance of men and materials from the Dockyard furnished by Captain Shirreff in the way which I thought most desirable, but by his presence and by the interest in the operations which he displayed, the services of all the subordinate persons were rendered fully efficient; while the part which he took as an active observer, from the beginning to the end, materially lightened my labours, and increased my confidence in the results."

From Deptford, Captain Shirreff was removed to the more important Dockyard at Chatham, which he actively presided over till November 1846, when he obtained flag-rank as Rear-Admiral of the Blue. On the 1st of September last he was appointed Admiral-Superintendent of Portsmouth Dockyard, and entered upon his duties with his usual zeal and ability. But his health, which had been greatly shaken by his various services, had been in a declining state for a considerable period; he bore this, however, so well that none but his intimate friends were at all aware of the extent to which he suffered. On the 30th of November he expired of an effusion into the lungs, at his official residence, in his 63d year. Having died in command, his remains were honoured with a public funeral on the 8th of December, being interred in the Military Garrison Chapel at Portsmouth, attended by all the civil, military, and naval authorities, under the usual ceremonials. In him the service lost an excellent and strict officer, the community a polished gentleman, and this Society one of its early and active members.

The Rev. WILLIAM PEARSON, LL.D. F.R.S. F.R.A.S., &c. Rector of South Kilworth, and one of the Board of Visitors to the Royal Observatory of Greenwich, was born at Whitbeck, Cumberland, on the 23d April, 1767. He was educated at the grammar-school of Hawkshead, and is said to have very early shewn a

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strong liking for mechanism. While residing at Lincoln he constructed a portable clock (still in the possession of his family), which shewed the phases of the moon in conjunction with the ordinary time. He contrived and executed various machines for exhibiting and explaining astronomical phenomena, among which are mentioned various planetariums, and an exemplification of the system of *Jupiter*. Finally, he constructed "a large Orrery with equated Motions," of which there is a description by himself in Rees' *Cyclopædia*. He made too, with his own hands, an altitude and azimuth instrument, which is now in the possession of Mr. Patrickson, his nephew.

In 1811, Dr. Pearson became the proprietor of a celebrated establishment at Temple Grove, East Sheen, where many of the nobility and gentry received their preparatory education. Here he built an observatory and furnished it with instruments.

In 1817, Dr. Pearson was presented by Lord Chancellor Eldon to the rectory of South Kilworth, Leicestershire, where (after quitting Temple Grove in 1821), he constantly resided. An observatory was at first arranged in a new wing to the rectory-house, but he ultimately erected a detached observatory on a considerable scale, and at a convenient distance. Here he set up the principal instruments which he had collected, and employed a permanent assistant, whom he carefully trained in observation and computation.

Dr. Pearson contributed very largely to Rees' *Cyclopædia*, having furnished, as we believe, *all* the articles which relate to practical astronomy and to the mechanical construction of timekeepers, telescopes, instruments, orreries, &c. These extend to sixty-three separate contributions, illustrated by 110 plates, which must have given him considerable occupation during the years 1806–1818, when the work was in progress. Probably he derived considerable assistance from his intimate friend Troughton, as well as from Tulley, Hardy, &c., all most eminent artists at that time in their respective callings; still he must have relied mainly on his own practical skill as a mechanician, and on his own personal acquaintance with the tools and methods of astronomy.

In 1824, Dr. Pearson published the first volume of his great work, *A Treatise on Practical Astronomy*, in two large 4to volumes. This first volume consists chiefly of tables, most of which were computed specially for the work under the author's direction. It is dedicated to the President, Vice-presidents, and Members at large, of the Astronomical Society. In 1829 the second volume appeared, dedicated with great propriety to his intimate friend, the distinguished artist Troughton. In this volume Dr. Pearson communicated not merely descriptions of instruments, but whatever his long practice had taught him of precautions in observing, or methods of reduction. At the present time, so great has been the advance of astronomy in the last twenty years, the *Treatise on Practical Astronomy* must rather be considered a book of reference than one of routine and direction. It will always continue to be of great value, and is necessary as a commentary and illustration of this branch of our science during the generation just past. This laborious and costly work was published at the expense of the author, with a certainty of great pecuniary loss.

When the establishment of an observatory at Cambridge was proposed on the grandest scale, and at an outlay greatly beyond the means of the University, Dr. Pearson contributed fifty guineas in aid of that spirited design.

He was appointed a Visitor of the Royal Observatory of Greenwich by Mr. Davies Gilbert, then President of the Royal Society, when the Board of Visitors was remodelled ; and so far as his health permitted, he was a regular attendant on their meetings.

Dr. Pearson retained his mental faculties and bodily strength to an advanced age, though suffering occasionally from attacks of gout. He died at South Kilworth on September 6, 1847. He was twice married, and left an only daughter by the first marriage; the second Mrs. Pearson survives him.

Such are the principal events of Dr. Pearson's scientific life which we have been able to collect. He outlived most of his contemporaries and familiars, or undoubtedly more particulars might have been gathered with profit, and related with interest. To the record of his exemplary professional life as a clergyman and magistrate, we can scarcely be considered parties.

All mention of Dr. Pearson's connexion with the Astronomical Society has been hitherto omitted, in order that it might be presented at once. Unfortunately, even here, there is some uncertainty, which we are not at present able to clear up.

It seems highly probable, that to Dr. Pearson we owe it that an Astronomical Society was founded. Existing documents prove that he took steps to originate such an institution so early as 1812, and that in this laudable attempt he was assisted by Mr. Troughton, Dr. Kelly, and others, whom we find among our earliest and warmest supporters. In 1816 this proposal had taken so much consistency, that Dr. Pearson, at the request of his coadjutors, wrote a preparatory prospectus and address, which were, he says, submitted to Lord Erskine, probably with a view to obtain his lordship's countenance and influential aid.

The documents in our possession do not enable us to trace the origin of the Royal Astronomical Society further back than January 12, 1820. On that day a meeting was held at the Freemasons' Tavern, which agreed unanimously to constitute themselves into a society for the cultivation of Astronomy,* to circulate an Address

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* There are two accounts of this meeting, a printed circular, and the MS. minute-book. There is a little difference in form, but not in substance, between the two. The circular ran thus :—

"*London, Jan.* 12, 1820.

"At a meeting of several scientific gentlemen, held this day, to take into consideration the propriety and expediency of establishing a Society for the encouragement and promotion of ASTRONOMY, it was unanimously agreed to form themselves into a Society for that purpose, to be called the *Astronomical Society*

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explanatory of their objects, and to invite the co-operation of such persons as were inclined to join their body.

The Address was written by Sir J. Herschel, and is entitled, "Address of the Astronomical Society of London," with the date, "January 1820." It will be found in the beginning of the first volume of the *Memoirs*. Sir John Herschel recollects that Dr. Pearson was active in pressing this service upon him.

On February 8th, the Astronomical Society met at the house of the Geological Society, according to appointment, and assented to the Rules and Regulations (see *Memoirs*, vol. i. pp. 9–20) which were proposed by the Committee: Dr. Pearson was appointed Treasurer *pro tempore*.

At the adjourned meeting of February 29th, the officers of the Society were elected, and Dr. Pearson was confirmed as Treasurer.

of London; and to frame a set of rules and regulations for their government and future proceedings.

It was then resolved,

1. That a Committee of eight members be appointed to draw up such rules and regulations; and that three be a quorum.
2. That C. Babbage, Esq. F.R.S.; F. Baily, Esq. F.L.S.; Capt. T. Colby, Roy. Eng. LL.D. F.R.S.E.; H. T. Colebrooke, Esq. F.R.S.; O. Gregory, LL.D.; I. F. W. Herschel, Esq. F.R.S.; D. Moore, Esq. F.R.S. S.A. and L.S.; and the Rev. W. Pearson, LL.D. F.R.S., be the committee above mentioned.
3. That a general meeting of the Members take place on Tuesday, Feb. 8th, at the house of the Geological Society in *Bedford Street, Covent Garden*, at 7 o'clock in the evening *precisely;* to take into consideration the rules and regulations which may then be proposed by the Committee.
4. That any person (recommended by one of the present members of the Society) who may be desirous of joining the Society at, or prior to, the above-mentioned general meeting, shall (on previously signifying in writing his assent to these resolutions, or on authorising a member by letter to signify the same on his behalf) be considered a member thereof without ballot.
5. That the Committee be authorised to draw up an ADDRESS, explanatory of the motives and object of the Society; and to circulate it in such manner as they may think fit.

"FRANCIS BAILY, Secretary *pro tem.*"

The Minute-book gives the names of all those present; states that they met by appointment, and that, before any other business, they signed the following mutual agreement:—

"At a meeting held this twelfth day of January, 1820, at the Freemasons' Tavern, London, to take into consideration the advantages that are likely to result from the establishment of a Society for the cultivation of Astronomy, we, whose names are hereunto subscribed, being fully aware of the utility of such an institution, do hereby mutually agree to constitute ourselves a society, to be called the Astronomical Society of London, and to be guided in our future proceedings by such rules and regulations as may be formed for such Society, in the manner to be appointed at the present meeting for that purpose."

Then follow the resolutions, and at the end there is a memorandum, "That it was omitted to be stated in its proper place that D. Moore, Esq., was unanimously called to the chair." Until the election of officers, Mr. D. Moore, and Mr. F. Baily, acted as chairman and secretary.

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This meagre account is all that can be confidently presented as vouched for by existing documents in the possession of the Society. There is nothing to shew by whom the meeting of January 12th was called, but it is said to have been resolved upon at a dinner-party given by Dr. Pearson at East Sheen, and mainly at his suggestion.* It is clear, that the first proposal of an Astronomical Society proceeded from Dr. Pearson; that this proposal was kept steadily in view by him and agitated for several years; and that he was one of the earliest and most zealous members when it was actually constituted. He continued in office as treasurer for more than ten years, and resigned on June 11th, 1830, when his non-residence in London, and increasing age, made his attendance at the Council too onerous.

A specimen of flint-glass was presented to the Society in 1823, by M. Guinand, of Neuchatel, which, with a disc of English plate, was worked into an object-glass of $6^{\text{in}}\cdot 8$ aperture, and 12 feet focal length, by Mr. Tulley. After careful examination (see *Mem. Ast. Soc.* vol. ii. p. 507), the Council offered this object-glass to sale by public tender, the overplus, after Mr. Tulley's charge for working was paid, being designed as a remuneration to M. Guinand. On this occasion, Dr. Pearson alone made a tender, and his liberal offer of 250*l.* was accepted. If we are right, this was at that time the largest object-glass in England, though it has since been greatly surpassed by object-glasses imported from the Continent, and by the works of our own opticians.

The gold medal of the Society was awarded to Dr. Pearson in 1829, for his *Treatise on Practical Astronomy*, when the complimentary address was delivered by Sir John Herschel, at that time President. The unsold copies of this valuable work have been for one or two years stored in our apartments, and were bequeathed by the author to us, along with the illustrative copperplates.

The Society's *Memoirs* contain several contributions from Dr. Pearson. It is understood that he left a Supplement to his "Catalogue of Stars within 6° of the Ecliptic," in considerable forwardness.

We regret that this notice of a member who has borne so large and so influential a part in the Royal Astronomical Society should be, as it is, manifestly imperfect, and we hope that additional information may yet be afforded from the recollections or inquiries of our members.

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* Some of the surviving original members have been consulted, and their impression seems to be that Mr. Baily had the principal share in the actual foundation of the Society. There is much internal evidence of his management in the business-like course pursued on February 8th; and however the Society may have originated, he was the chief agent in carrying out the idea vigorously and effectively. The minute-books of the Council, of the ordinary meetings, and of the general meetings, are all in Mr. Baily's handwriting, up to the vacation in 1822. But though it may appear clear that, from the first attempt at a union, Mr. Baily took that share of the actual details which he never relinquished, it must not be forgotten that Dr. Pearson was the first to whom it suggested itself that a Society for the promotion of Astronomy was needful and practicable, and was the first who attempted to impress that conviction upon others.

In the last Report the Council recapitulated the proceedings which had taken place with respect to the proposal of a medal for the researches which led to the discovery of the planet *Neptune.* The result was, that differences of opinion with respect to the relative places of M. Le Verrier and Mr. Adams, and the action of the bye-laws provided for such cases, prevented any medal from being awarded. A long and earnest discussion ensued in the last General Meeting upon this negative decision of the Council, for the general tenor of which it is sufficient to refer to the various amendments which were proposed on the question of printing the Report, as given at the end of that document. The result was, that a resolution was carried to the effect that a Special General Meeting should be called to consider of the propriety of suspending the bye-laws relative to the medals, and authorising the Council to award two or more, as might seem fit. The intention was simply to enable a new Council to come to a fresh discussion of the question, without the restrictions which had theretofore made a necessary alternative of the exclusion of one or the other of the two names which are immortalised by connexion with the discovery.

This Special General Meeting was held on the 12th of March. In the meantime it had become apparent, not only that the differences of opinion above alluded to would exist upon any measure which could be proposed, but that they would be likely to produce very serious effects upon the working power of the Society. The necessity of harmony in administrative bodies upon points which are held to contain and announce important principles, is too well known to need proof here; and the number of active supporters of astronomy, possessed of leisure to devote to the business of this Society, is not large enough to allow of an entire Council being chosen by the General Meeting, out of the supporters of one side only of a serious division of opinion. Under these circumstances, the Council could come to no other conclusion than that it was their duty to recommend the Society not to proceed further in the matter: and this course was warmly advised by those of every opinion on the disputed questions. And upon hearing the state of the case, the General Meeting almost unanimously concurred in the same view; and a resolution, to the effect that no further steps should be taken, was carried. The Council remembers with great satisfaction the amicable tone in which the above differences, more serious than any which had ever prevailed in the Society, were discussed at the meetings; and they feel assured that in no public body can the prospect of disunion arising out of divided deliberation be smaller than in ours.

When the time approached for the proposal of a medal for the present year, it became evident that astronomical progress, for the time being, was in a state very different from that in which the framers of our bye-laws found it. At the time when this Society

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obtained its charter, it was a circumstance not unfrequently remarked upon that there was a comparative paucity of great things, accompanied by a constant and gradual improvement of routine. Results of remarkable thought, as well as those of remarkable toil, though not wanting, were not abounding as in the days of William Herschel and Laplace; and we were not without those who prophesied that astronomy had nearly reached its resting-place — that the care of our generation and those who should come after us must be to keep the tools of our forefathers in good order, without seeking, or at least without finding, the means of new invention. Though this extreme opinion was far from having ground to stand upon, it may be admitted that the bye-law which restricted the Council to the award of one medal in each year produced no striking inconvenience for many years together. Recently, however, the number of proposals has somewhat increased: and those who were present at the Council in January last could not but admit that the propriety (if one medal only were to be granted) of postponing all claims to those of Messrs. Le Verrier and Adams, obvious as it might be, was accompanied by the full knowledge that there was an unusual number of well-supported claims to postpone. It cannot, therefore, fail to be seen that this circumstance, coupled with the open state in which the medal question of last year had been left, was likely to place the Council in a position of very serious embarrassment.

Fortunately, however, the difficulty increased to such an extent, as, by its own magnitude, to become no difficulty at all. The completion of various astronomical labours of the most distinguished character has marked the course of the year 1847; and the discovery of no fewer than three planets has rewarded two most skilful and assiduous observers. Several members of the Council began to feel that the notion of discriminating between claims so various in character, so well supported in circumstances, so unequivocal in merit, so unexpected in number, must be abandoned — that the epoch must be recorded, as well as the individual men to whom its peculiar glory is due. It seemed as if Astronomy had exhibited the results of every kind of human aid, and had chosen the year 1847 to shew how well she could at once command the highest speculations of mathematical intellect, the laborious perseverance of calculating toil, the discriminating sagacity of the observer, the munificence of mercantile wealth, and the self-devotion of the voluntary exile. An opinion was pretty generally agreed in, almost as soon as first expressed, that something of a more comprehensive nature than any practicable award of medals was demanded by the existing circumstances; and it was felt that a Testimonial, including those to whom those very recent additions to our knowledge were due, would be a proper tribute, as well to them as (if we may say it) to the period which they have rendered so remarkable.

With this feeling existing, it was proposed at the meeting of the Council in November, and on the subject of the medal arriving in due course, that the several Members should propose their candidates for the medal, just as if an intention existed of proceeding to the selection of one in the usual manner. The following names, here taken in alphabetical order, were put forward in answer to the proposal:—Mr. Adams, for his inverse application of the theory of perturbations; Mr. Airy, for his voluntary reduction of the ancient lunar observations made at Greenwich; Mr. Argelander, for his catalogues of stars; Mr. Bishop, for his foundation and maintenance of an observatory which has enlarged the solar system; Colonel Everest, for his completion of the meridian arc measured in India; Mr. Hansen, for his additions to our knowledge of the lunar theory; Mr. Hencke, for his discovery of two planets; Sir John Herschel, for his astronomical labours in the southern hemisphere; Mr. Hind, for his discovery of two planets; Mr. Le Verrier, for his inverse application of the theory of perturbations; Sir John Lubbock, for his researches in the theory of planetary perturbations; Mr. Weisse, for his zeal in the reduction of observations of stars.

On a review of this list, it speedily became apparent that it did not include a name which might not be most worthily added to the list of medallists with which the Society is able to honour its successive volumes of *Memoirs*, and which would not be so added if it stood alone. The plan of the Testimonial was, therefore, resolved on: that is to say, the Council, looking on the proposal as that of a *bonâ fide* departure from the bye-laws relating to the medals, resolved to apply to the Society for power to deliberate upon the proposal. This was done at a General Meeting convened for the purpose on the 10th of December, and the power applied for was granted by an unanimous vote of that meeting. The end was, that the plan was adopted at the meeting of Council held on the 14th of January.

In regard to this Testimonial there are two points which the Council think it necessary to mention. It is confined strictly to astronomical services completed within a recent period—to matters which might reasonably have been expected to have been under ordinary discussion for the medal of 1848. It is impossible, therefore, the Council trust, that they shall be held to undervalue any of the great things which have been done for astronomy by the same or other men at other times. Secondly, no idea of any comparison between those included in the list has been for a moment entertained. A look at the reasons of the various awards will shew that no such idea could possibly have been entertained. The merits, for example, of Mr. Adams and M. Weisse (to take a name from each end of the alphabetical list), are wholly distinct in species, though each are great of their kind. The same is to be said of those whose labours more resemble each other; and in particular, of those of M. Le Verrier and Mr. Adams. Had this been the first occasion on which the Council brought these two names before you, it would have been necessary either to enter on a critical examination of the question which they have referred to history, or to make a somewhat laboured, and perhaps unsuccessful, attempt to shew that the testimonial thus jointly awarded involved no opinion, and justified no inference on the comparative rights of the two. But after the discussions of last year, the Council is fully satisfied that not you only, but the astronomical public of Europe, will understand their proceeding in its true sense; namely, that these distinguished names are placed together in the same sense and manner as those of Sir John Lubbock and M. Argelander, or those of Mr. Airy and Mr. Bishop; that is, just as though the merits admitted of no more comparison as to homogeneity in the first pair of cases than in the second or the third.

The Testimonial decided upon has been an inscription, handsomely printed on vellum, of which the following is a copy:—

"In recognition of the great advances recently made in astronomy, and in gratitude to those who made them, the Royal Astronomical Society has awarded this public Testimonial to certain distinguished astronomers, among whom is *A. B.*, whose [*here the services are briefly stated*] place him among those who have greatly contributed to the progress of human knowledge, and who is hereby most respectfully requested to accept and preserve this acknowledgment of his talent, energy, and success."

And the Council, in awarding this Testimonial, in place of and in the same rank with the usual medal, desires the receivers of it to be assured that, in their opinion, the honour of bestowing it does not fall short of that of receiving it, though the merit of appreciation is not equal to that of desert.

The Council has requested the President to undertake the usual office of addressing you on the specific and several services for which the Testimonial is given. But as his own name is in the list, they are obliged, no matter how far their description may fall short of what he could have done for another, to offer a few words, and but a few, on the grounds which have determined their vote in his case; not in the way of formal justification, for that is needed neither here nor elsewhere, but rather in justice to themselves, and as having a right to shew that they are not behind others in their perception of his eminent contributions to astronomy. At the same time, the position in which Sir John Herschel stands to us, and his actual presence among us, make the Council think it right to say less than they might otherwise feel pleasure in saying.

It is hardly necessary to remind you that four years and part of a fifth, beginning with 1834, were passed by Sir John Herschel at the Cape of Good Hope, with the avowed, and now happily completed, object of extending to the southern hemisphere the plan of observation which had been exhausted in the northern, with unity of instruments, methods, and purpose. The results of this labour are now published in a splendid volume, at the expense of the present Duke of Northumberland, in fulfilment of an offer made by the last holder of that ancient title, the munificent donor of the Cambridge Equatoreal. To an expression of respect for the memory of this truly enlightened nobleman, and of gratitude to his worthy successor, the Council feel that they may be permitted to add one of congratulation. The number of great houses in Europe exceeds by hundreds to one the opportunities of connecting their histories with works like the present.

Sir John Herschel's undertaking is well known to have been determined, in the first instance, by a resolution to follow the track which his illustrious father had opened. Whatever of personal interest may have been created in the subject during its pursuit—and this cannot have been small—the original motive was of a character which must command respect, independently of all simply astronomical considerations. Without any infringement of the claims of the pursuit which we are here met to promote, we may admit that it was fortunate for astronomy that the love of science was reinforced by this strong inducement of a distinct kind. To the united effect of both we owe the degree and quantity of the exertions which have done for the two hemispheres what it would have been admirable that one head, and one instrument should have done for either alone.

The manner in which the researches made in the southern hemisphere have been conducted, so far resembles that adopted in the northern, that no general sketch could be useful as to the former, while the latter are so widely known. Nevertheless, this volume, though it carries in its title a specific reference to the southern hemisphere, contains matters of conclusion and of observation which belong to both. Such are the details on the law of distribution of nebulæ and clusters; and such are the new and valuable researches on the apparent magnitudes of the stars taken in sequences of observations, with a studied connexion of the different sets; such are also the observations of and discussions on Halley's Comet. But from these results, striking as they are in themselves, the mind returns to the consideration of the great whole which has thus been completed. The entire surface of the heavens surveyed in these details which most require unity of natural eye and artificial help, and not only surveyed but measured—the records of this enormous labour carefully reduced and clearly presented—the intellectual conclusions of this vast mass of thought worked out with the patience which is not seen and the sagacity which is — demand a notice which even the presence of the observer, calculator, and discoverer, will hardly restrain within the usual limits of personal eulogium.

The inhabitants of the Cape of Good Hope have marked their desire to perpetuate the memory of the astronomer's sojourn among them, by placing an obelisk on the precise spot occupied by the reflecting telescope ; a monument which, remembering the difficulty lately experienced in fixing the exact locality of Lacaille's observations, will be judged to combine astronomical utility with the gratification of the good and right feeling which suggested the erection. But the Council cannot help hoping that this second visit has happened in better times than those of the celebrated Frenchman : and that its best and most lasting record will be written in the impulse given by it to the cultivation of all sound and liberal knowledge.

The Council have this day gratified you and themselves by the acknowledgment of many different kinds of astronomical merit: but they confidently appeal to you, and all those who can venture an opinion, whether in the case now before them any one of these different kinds of merit is wanting? The well-known power of mathematical invention, the accuracy of the experienced observer, the laborious perseverance of the reducer, the skill of the practised mechanist, the suggestive faculty of the experimental philosopher, have met in one person with the graphical skill which usually marks the finished artist, and the power of language which is so necessary to the success of the poet. To these we are to add the liberal sacrifice of private means, and the devotion, to this part of the work alone, of twelve years of man's short life, several of which were passed in a distant region. And, having mentioned the sacred motive which urged Sir John Herschel to the first undertaking, the Council will briefly allude to the fact, known to themselves, that but for attention to the comfort of another parent, it might have been sooner completed. And as briefly will they express their respectful admiration for another person, whose willing assent to the plan, and untiring endurance of its attendant exile, must have been no small element of its success. To Lady Herschel, who furnished her part of the moral strength of this memorable expedition, a share in the honours of the conquest is justly due, and gladly paid.

The Council will, of course, refer you to the President for some detail on several matters which otherwise would have found their place in this Report. They proceed with their general notice of the progress of the Society and of the science.

The choice of Associates has hitherto depended, as to first proposals, on the motion of individual Fellows of the Society. It has appeared to the Council to be desirable that such method should be introduced into the first proposition as already exists in the subsequent stages of the election. With this view it has been referred to a Committee to consider whether it would not be desirable, without lessening the right of proposal which already exists, to cause a yearly or other periodical presentation of names to be prepared by a committee appointed for that purpose. The object is to secure a proper attention to the names of rising astronomers, independently of the casualties of individual suggestion. A Report made by the Committee, and received by the Council only this day, recommends that the names of several astronomers be added to the list of Associates, and the usual proposal will be suspended in the meeting-room for each of these names.

The Solar Eclipse of 1847, October 8, which was annular in parts of Austria, Italy, France, and England, was expected with great anxiety, as likely to give important information on those curious phenomena attending the internal contact of the sun's and moon's limbs, which, since the publication of Mr. Baily's observations of the eclipse of 1836, have excited so much attention. In

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England, the Astronomer Royal, remarking that it was doubtful whether the eclipse would be annular at Greenwich, had (with the assistance of the Rev. G. Fisher, Mr. Riddle, Mr. J. Riddle, Mr. Baillie, and by detaching assistants from the Royal Observatory, using also the subordinate assistance of a number of intelligent and skilful lads of the Greenwich Hospital Schools,) equipped in the most perfect manner four stations to the north of Greenwich (the northernmost being Chingford in Essex), and three stations to the south of Greenwich (the southernmost being Háyes in Kent). At none of these was the eclipse seen at all during its annular phase. In France, the Bureau des Longitudes despatched M. Mauvais and M. Goujon to Orleans, a station on the edge of the annular track, and this expedition was perfectly successful. In Italy, the Observatory of Padua being situated almost exactly on the southern limit of annularity, as Greenwich was on the northern, M. Santini had (by arrangement with the Astronomer Royal) prepared for observations on a series of stations in his meridian; but here the eclipse was not seen. Accounts of the observations have been received from Styria (where it was seen by M. Schaub), and from other places. The statements in regard to the visibility of Baily's beads are very discordant: some of the observers declare that nothing was seen except projections corresponding to visible mountains of the moon, while others think that the appearances which they saw tend to support Mr. Baily's descriptions.

It will be remembered, that some time ago Sir John Herschel (in communicating Mr. Griesbach's series of drawings of solar spots) called the attention of astronomers to the desirableness of collecting unbroken series of graphical descriptions of the sun's surface. The Council have much pleasure in announcing the receipt, from the Rev. J. T. Hussey, of a most excellent addition to the above store, consisting of 1100 drawings of the sun's surface, from April 1826, to December 1837. Some account of this work will appear in the usual manner, but the Council cannot help here expressing, with their gratitude to Mr. Hussey, their hope that his example will be followed.

Since the last Anniversary of the Society five Comets have been discovered.

The first was found by Professor Colla, at Parma, on the evening of May 7. It was always faint, and visible only with powerful telescopes. Two comets only, of the 180 that have been calculated, viz. those of 1729 and 1747, have perihelion distances greater than Colla's. M. Littrow observed it pretty regularly till the middle of November; but we have observations from Professor Challis and Mr. Lassell in December. A parabola satisfies the whole series of observations very well.

On July 4th, M. Mauvais detected a comet not far from the pole, which was very generally observed till October. It exhibited a stellar nucleus, and at one time a short tail. The orbit is greatly

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inclined to the ecliptic. This comet is the third discovered by M. Mauvais.

On July 20, M. Brorsen, assisting at Professor Schumacher's Observatory at Altona, made his third cometary discovery. Clouds prevented regular observations until the 21st. M. Rümker followed it until the morning of September 13th. It was soon ascertained that a parabola would not represent the observations, but there are considerable discordances between the elliptic elements that have been computed. M. d'Arrest gives a period of twenty-eight years, while other calculators make it more than a hundred, each conclusion depending on three positions only. The whole series of observations has not yet been fully discussed.

M. Schweitzer, Director of the Observatory at Moscow, discovered another comet near ε *Cassiopeiæ* on the night of August 31st. It was meridionally observed at Altona several times during the month of September, but was never visible without the telescope.

The next comet was discovered independently by Miss Mitchell, in America, on October 1; by De Vico, at Rome, on the 3d; with the naked eye at Cranbrook, by the Rev. W. R. Dawes, on the 7th; and by Madame Rümker at Hamburg, on the 11th. When brightest it resembled a star of the 4th magnitude with unassisted vision, but in the telescope it appeared as a large diffused nebulosity, and on one or two occasions exhibited a tail about 2° in length. It approached pretty near the earth. The perihelion passage took place in the middle of November, but, owing to the great south declination of the comet, it was lost sight of in these latitudes about October 18th. The observers at the Collegio Romano recognised it again on its return from the southern hemisphere, early on the morning of December 10th.

On the 1st of July last, M. Hencke, the discoverer of *Astræa*, detected another small planet with the assistance of Bremiker's Chart for the seventeenth hour of right ascension. At this time it resembled a star of the 9th magnitude, but speedily became fainter and was generally visible as a ruddy star of the 10th magnitude. At the request of the discoverer, Professor Gauss named the planet, deciding upon *Hebe*, with a cup for the symbol. The observations of *Hebe* are pretty numerous. Her period appears to be longer than *Vesta's*, but not so long as that of *Juno*.

The planet *Iris* was discovered by Mr. Hind at Mr. Bishop's Observatory, on the evening of August 13th, in following up a systematic examination of the heavens which had been commenced some months previous. There being no star on Wölfer's Map, Hora xix. of the Berlin Charts, in the position of the planet, and Mr. Hind having looked over that part of the heavens several times during June and July, its nature was very soon decided, and the discovery was announced generally to astronomers in this country next day. It was observed at Cambridge on the 14th, and at Greenwich on the 15th. The observations made both in this country and on the Continent are very numerous. The time of revolution appears to be nearly the same as that of *Vesta*, perhaps a few days longer. Professor Gauss has recently published the limits of a zodiac for *Iris*, which will probably assist in discovering any former observations of the planet that may exist in the works of Lalande, Bessel, or others. *Iris* has generally equalled in brightness a star of the 8·9 magnitude. The symbol adopted for this planet is a semicircle to represent the rainbow, with an interior star and a base line for the horizon.

On the night of October 18th, another small planet was detected by Mr. Hind, at Mr. Bishop's Observatory, near the star Bessel v. 48, of Weisse's Catalogue, with which it was compared. At the time of discovery it was not very far from its stationary point. During the month of November it equalled in brightness stars of the 8th magnitude, but at present it is a little below the 9th. The elements of this planet, which has received the name of *Flora* on Sir John Herschel's proposition, have already been determined with a considerable degree of accuracy. There appears to be no instance on record where the orbits of various astronomers for a planet or periodical comet have agreed so well together: the values of the mean daily motion in the several orbits do not differ more than 2″ or 3″, and the other elements are very accordant. The period of revolution of *Flora* is shorter than that of any other of her companion planets. The symbol adopted for her designation is the figure of a flower. Observations of the planet will be practicable for some months longer, and an ephemeris, extending to May 1, is given in the last number of our *Monthly Notices.*

After an honourable service of between thirty and forty years, the principal Greenwich instruments are found insufficient for the present demands of astronomy. The Observatory, as is well known, does not enjoy a very clear atmosphere, and the optical power of the transit and circle telescopes is quite unequal to the satisfactory observation of the newly discovered planets, and of the small stars which are so frequently wanted as points of comparison for extra-meridian observations. For these reasons the Astronomer Royal has proposed (and the Board of Visitors has seconded his proposal) to purchase the finest object-glass of 12 feet focal length, and not less than 8 inches' aperture, which can be had. This he intends to mount as a transit circle, and so make the observations in R.A. and N.P.D. with the same instrument at the same time. His opinion is, that by the use of a stouter and tougher material than hammered brass, and, by a better construction, he can get a far stiffer transit than the present one (the excess of length will only be 2 feet), which can scarcely be doubted. He is also of opinion that more reliance can be placed on a circle all in one piece than in one composed of so many parts as the mural circle, notwithstanding the skill of the best workmen has been tasked to the uttermost in its fabrication, that the connexion between the telescope and circle will be less liable to suspicion than it is at present, and that the clamping apparatus, &c. will be far less objectionable. The graduation may be equally perfect, and the reading microscopes more firmly secured and more uniformly illuminated than they are now. However bold these opinions may at first sight appear to us who have long admired the Greenwich transit and circles, we are certain that while no one is more competent to form a correct opinion on the subject-matter than Mr. Airy, the honour of the Royal Observatory is so dear to him that he will act with due deliberation. Some great practical advantages will clearly result from the substitution of one instrument for two: there will be no observation in right ascension, for instance, without a corresponding observation in north polar distance — a circumstance which sometimes occurs, and is particularly troublesome and vexatious; a single observer, too, will be sufficient for a complete observation, a great relief to a small staff when the weather is baffling or the hour unseasonable.

The zenith tube, from which so much was expected, has not justified expectation. The late and present Astronomer Royal have exhausted all the means which suggested themselves for its amelioration; but, after all, the results are scarcely equal to those of the mural circle. The situation is inconvenient to the family of the Astronomer Royal, and is unsuitable to the instrument: on these grounds, the Visitors have acquiesced in its removal. Perhaps, when it is more satisfactorily placed, *i. e.* in a room where the temperatures above and below are not excessively unequal (and such a one Mr. Airy has found), much of the present irregularity may disappear, and the instrument be finally of use, instead of a mere drag on the Observatory, as it is now found to be.

The Report which we have to make of the progress of the Standard Scale is not altogether satisfactory. There has been much delay, which may be partly accounted for by the non-residence of the experimenter, and by those checks which always occur from bad health or other causes, when only a nice workman and an experienced hand can be employed. But, besides this, some anomalous discrepancies have presented themselves, the causes of which are only just discovered; if, indeed, they *are* now discovered. Some months ago it was remarked, that when two similar bars of the same metal and similarly supported were compared, the results of the series made in the course of the same day, perhaps on following days, agreed most satisfactorily—the probable error of one day's comparisons scarcely exceeding 0·00001 of an inch,— but that, when a considerable interval had elapsed, or when any change had been made in the position of the bars, &c., the results of other series, equally accordant among themselves, would shew a great change in the absolute difference. Thus, the result of very accordant observations at one time, would differ from the result of equally accordant observations at another time, as much as $\frac{1}{6000}$ or $\frac{1}{7000}$ of an inch. This could not arise from expansion, in its ordinary mode of action, for the bars were either of the same metal, or the expansion was allowed for. In all these instances the com-

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pared bars must have been nearly at the same temperature, and very little exposed to any change. On considering the matter, no reasonable cause could be assigned for these extravagances by Mr. Sheepshanks and Mr. Simms, or by the Astronomer Royal, who was consulted; except, perhaps, that the illumination might be in fault, or that the points of support might not always be precisely the same, or sufficiently free. Neither cause seemed likely; the light was necessarily thrown down at a definite angle, and, granting that the supports of the bar might act somewhat irregularly, it was by no means obvious how that could affect the length of the central axis of the bar, on which the divisions are marked. Some modifications, however, which have been lately made in the illuminating apparatus, shew that considerable variations in the bisections *may* arise from this cause; and at present it seems not unlikely that, when the light is better arranged, a greater accordance in the results may be obtained. A more perfect support for the bars is also preparing, and in a short time it is hoped that a solution, more or less complete, of the present difficulty, will be obtained. All the ulterior work has been ascertained to be of easy execution.

Among the numerous contributions to Astronomy during the past year, your Council is particularly bound to notice the Reduction of the *Histoire Céleste*, and of the Southern Catalogue of Lacaille, which have been calculated at the expense of the British Association, and published with the liberal aid of Her Majesty's Government. As most of those present (all who are practical observers) know these volumes experimentally, we need not point out their obvious utility for times past and future as well as for the present. But we may remark with satisfaction, that the principal promoter of these valuable works was Francis Baily, who also directed and superintended, up to the time of his death, the preparation of the *Histoire Céleste;* that Professor Thomas Henderson undertook the charge of Lacaille's Catalogue; that our late Assistant Secretaries, Messrs. Hartnup and Harris, performed most of the calculations; and that when the premature deaths of three of these gentlemen had left both catalogues incomplete, they were finished and given to the world by Lieutenant Stratford, aided by the counsel of Sir J. F. Herschel. It is not often that instances occur of so much able and gratuitous co-operation, supplied by the members of one society.

In the last Annual Report an account was given of the progress in the construction of the Altitude and Azimuth instrument intended for the Royal Observatory of Greenwich; an instrument to the erection of which we attach considerable importance, not only because in its construction greater attention is given to the principles of firmness and of union of parts in the same metal than was ever given before, but also because the adoption for daily use of such an instrument, expressly intended for more frequent observation of the moon, marks clearly the policy which is likely to direct the future proceedings of our National Observatory. We have now to report that this instrument is mounted, and in regular and efficient work. In respect to the increase in the number of observations of the moon, we are enabled, by information received from the Astronomer Royal, to furnish the following statement:—From 1847, May 16 (the first day of use of the instrument), to December 31, the number of days on which the moon was observed with the new instrument was 127, while the number of days on which the moon was observed with the meridional instruments was only 70. When it is considered that a great part of the additional observations were made in portions of the moon's orbit in which meridional observations never could be made, it will be evident that this increase is, in reference to the lunar theory, of the very highest value. On every day of observation (with the exception of only two or three), two azimuths and two altitudes of the moon, in opposite positions of the instrument, have been obtained; on some days, a considerably larger number. In regard to the accuracy of the instrument, as all the star-observations of 1847 are reduced, we can make the following report:—The observations of zenith distance have never given the smallest difficulty; and there is no doubt that, from the first, they are nearly or quite as accurate as observations with the mural circle. It is in the observations of azimuth, as anticipated by the Astronomer Royal, that some difficulties have arisen. The first of these were, discordances to a great extent in the zero point of azimuth. After a careful consideration of every possible cause of error (an inquiry which was very much facilitated by the confidence in the firmness of the instrument consequent on the peculiarity of its construction), it was concluded that the discordances were occasioned by the use of too powerful counterpoises for relieving the pressure of the pivots of the vertical circle. The counterpoises were reduced by one-third, and the discordance disappeared. The next difficulty was in the determination of the value of the level-scales, a difficulty which was more strongly felt in the long levels applying to the correction of azimuth than in the shorter levels required for the zenith distance. After different attempts at correction, it was determined to mount the glass-bubbles in Y's, in the same manner as in the best German levels: this has been done, and the levels now appear free from error. There still remains a small occasional variation of azimuth zero to the amount of about 3″ or 4″, of which it is difficult to assign the cause: it may arise from a small twist of the brick pier, or it may arise from a small disturbance of the transit instrument by the use of which the clock times are converted into sidereal times, or it may arise from a variation in the personal equation of the observer. In its effects it is unimportant, as the nature of the combination of the observations will eliminate the effect (supposed constant for the same day) on the place of the moon. The observations of the moon are not yet entirely reduced.

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The transfer of the Edinburgh Observatory to the Government, which is in process of adjustment, and still more, the repairs of the building, which have occupied a much longer time than was expected, have put obstacles in the way of that institution. It is hoped that every thing will be again in working order in June next. In the meanwhile, a portable transit, for time, has been erected in an outhouse, in the new manner proposed for the larger one, namely, on a cast-iron stand, without any adjusting screws; and its bearings have given great satisfaction by their permanence. The volume of observations for 1841, made during the direction of Mr. Henderson, will appear almost immediately; and that for 1842, perhaps in May.

In the last Annual Report an account was given of the progress made by Mr. Maclear in the verification of La Caille's Arc of Meridian, in the Cape colony, and in the extension of it, both ways, to terminations in localities more favourable for eliminating the disturbance of mountain masses than those adopted by La Caille. The northernmost point which Mr. Maclear had then reached (a point on the Kamies Berg), though greatly preferable to La Caille's station at Klyp Fontein, was not wholly unexceptionable. Mr. Maclear, therefore, with the full approval of every person who examined into the subject, determined on extending the measurement to a station about one degree further north, on the extensive plain called the Bushman Flat, near the Orange River. The astronomical part of the operation was completed in the last summer, and in July 1847, Mr. Maclear, having undergone personal hardship and difficulties of every kind almost unprecedented, returned to the Observatory for permanent residence. Bradley's zenith-sector, with which the differences of latitude were determined, was returned to the Observatory in September; and it was Mr. Maclear's intention immediately to take steps for the verification of its divisions, and for observation at the Cape Observatory of the stars which had been observed at the Bushman Flat. The geodetic part was not quite finished, Mr. Montague being still fixed on the Kamies Berg, waiting for the opportunity to measure some horizontal angles. The whole extent of the arc is now about 4°½. We congratulate the lovers of physical science on the near prospect of the termination of this work. The anomaly presented by La Caille's measure had been one of the most puzzling difficulties in the theory of the figure of the earth, and it was incumbent on us to shew that we, in possession of the colony, could display as much zeal in verifying the measure as was exhibited by a foreign visitor in making it. The value of this verification has been *infinitely* increased by the extension now given to the arc.

In the meantime, the proper interests of the Observatory have not been neglected. The principal part of the stars of comparison with Mauvais' second comet have been observed, and their places, in the hands of M. Plantamour, have already done good service. At the date of the last reports from Mr. Maclear, he had mounted (upon a polar axis, sent from the Royal Observatory of Greenwich) a good telescope belonging to the Cape Observatory. He was also looking anxiously for a 6-inch equatoreal of M. Merz's fabrication, which was despatched from this country in November last. We may now look for a regular series of observations, both meridional and extra-meridional, such as, under the peculiar circumstances of the locality, may be judged most valuable to the interests of astronomy.

The seventh volume of the *Oxford Observations* will soon be published. The work has been recently confined mostly to observation of circumpolar stars. About four-fifths of those in Groombridge's Catalogue have been observed, and about one thousand others. No extra-meridional work has been attempted. Mr. Repsold holds out hopes that the heliometer will be finished in the course of the present year; the many modifications which he has thought it advisable to make in preceding forms of construction has occasioned the delay.

On the Cambridge Observatory Professor Challis makes the following remarks, in a letter to the Secretary. The Council have already advocated the principle here announced, and have much pleasure in giving the extract:—

"After conversation with the Astronomer Royal, I have fully come into an opinion which he strongly advocates, that in the present state of astronomical science it is important to attend to a division and distribution of labour. Meridian observations of the planets, and observations of the moon, are so completely taken care of at Greenwich that it would be comparatively useless to prosecute them here, whilst equatorial observations are nowhere attended to in an equal degree. I propose, therefore, to direct the force of this observatory more especially to equatorial observations, and, in particular, to those requiring the use of a powerful telescope. Already I have partly acted on this plan, by taking observations of the newly-discovered planets about the time of quadrature, when they are no longer visible on the meridian, and by pursuing them as long as the power of the telescope, or their proximity to the sun, will allow. These observations are intended to aid in perfecting the theories of these new bodies."

The Equatoreal for the Liverpool Observatory is advancing very rapidly to its completion, and will soon be in its proper place. Some delay has arisen from an oversight in casting the base at first with an insufficient depth of metal, but this has been repaired. The object-glass is of eight inches' aperture by Merz, and the mounting, which has been prepared under the immediate direction of the Astronomer Royal, promises, in firmness and convenience, to surpass the constructions hitherto adopted. In the meantime, Mr. Hartnup has been devoting his spare time to perfecting the chronometer balance, in which he believes that he has succeeded. It is well known that the best-made chronometers of the usual construction can be made to keep the same rate at any two given temperatures, but that the rate changes at an intermediate temperature, and at temperatures beyond the given temperatures, higher or lower. Messrs. Eiffe, Molyneux, Dent, &c., have attacked this difficulty (which is, indeed, a very serious one in long voyages, when the timekeepers are exposed to great varieties of climate), and by various methods. Mr. Hartnup has proposed a different construction, and some chronometers, furnished with the new balance, have performed very satisfactorily. He intends, with the permission of the Astronomer Royal, to send some to Greenwich for examination.

The contributions received from unprofessional astronomers during the past year have been numerous, and of great value. The merits of Mr. Bishop and Mr. Hind are the theme for another portion of this Notice in the President's speech.

The instruments of the Observatory of Markree are of the highest class. The equatoreal refractor is, we believe, the largest refractor in use after those of Poulkova and Cambridge, U.S.; and the meridian circle is probably not inferior to any instrument of its kind. The proprietor, Mr. Cooper, has found a most able and zealous assistant in Mr. Graham.

At Makerstoun, Sir Thomas Brisbane has an observatory in full activity, but it is principally directed to magnetism and meteorology. The equatoreal, however, which is a first-rate instrument, has been usefully employed by Mr. Welsh in comparing the newly-discovered faint planets with neighbouring stars, under Mr. Broun's immediate superintendence.

The Durham Observatory is directed by Professor Chevallier, but as his university engagements are too engrossing to leave much time for the practice of astronomy, Mr. Thompson has been engaged as an assistant. This observatory has a transit circle (which is a better instrument, perhaps, for determining right ascensions than north polar distances), and an admirable equatoreal, an original Fraunhofer, of six inches' aperture.

Mr. Dawes is pursuing his observations of double stars at Cranbrook; he has sent some occasional observations and remarks.

The American Observatories of Washington and Cambridge, U.S., have contributed several valuable sets of observations: the Continental observers, whose communications have been received and published, are too well known to require particular notice.

The *Notices* of the past year contain so many and such interesting communications from Mr. Lassell, that it is scarcely necessary to do more than allude to them here. The discovery of the satellite of *Neptune*, the final observations of Colla's Comet, those of the satellites of *Uranus*, and of the interior satellite of *Saturn*, shew that the personal skill and instrumental means of Mr. Lassell

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place his Observatory at Starfield in the same line with the Imperial Observatory of Poulkova, or the State Observatory of Cambridge, U.S. It must not be forgotten that Mr. Lassell has to struggle with a very indifferent atmosphere and somewhat delicate health; that the construction of the instrument is *original*, the large mirror, the *work of his own hands*, aided by machinery of his *own erection*, and placed in a building *of his own architecture;*[*] that he has had *no assistance* of any kind, and not much sympathy nor countenance, except from this Society and its members: besides all this, he is necessarily engaged in conducting a laborious and harassing business.

Among the Communications which have been received by the Society since the last Annual Meeting, is one by our Associate, Professor Hansen, on two inequalities in the motion of the moon. No equally important addition has been made to physical astronomy during many years. For more than half a century the want of a small correction to the moon's theoretical motion, of the nature of an inequality of long period, had been recognised by physical astronomers. Several conjectural terms had been suggested, adopted for a time, and finally disproved. Professor Hansen has shewn clearly that this correction is given by the introduction of two terms, depending on the perturbations which the action of *Venus* produces in the motion of the moon. One of these arises from a remarkable numerical relation between the anomalistic motion of the moon and the sidereal motions of *Venus* and the earth; the other is an indirect effect of an inequality of long period in the motions of *Venus* and the earth, which was discovered some years ago by the Astronomer Royal. The systematic nature of the research made by Professor Hansen for the discovery of terms of this class seems to exclude the possibility that any other similar inequalities of appreciable value will be hereafter found. As an instance of careful and orderly inquiry into the effects produced by forces of a very complicated kind, of application of refined methods to the computation of the results, and of ultimate success, this investigation by Professor Hansen may be compared with any in modern physical astronomy.

Our distinguished Associate, M. Le Verrier, has occupied himself with the question of the identity of comets of short period discovered within a few years with comets observed in preceding centuries. An oral communication on this subject was made by M. Le Verrier at the meeting of the British Association in Oxford in the last summer, and copies of a written paper have been printed in the *Comptes Rendus* of the French Academy, and in the *Astronomische Nachrichten*. A manuscript copy of the same paper was transmitted by the author, as a mark of friendship and respect, to this Society; and only the accidental absence of the Astronomer Royal (to whom it was immediately entrusted) prevented an exposition of its contents from having been sooner laid before the Society. The first of these inquiries related to Faye's Comet; and the special question is, Whether Faye's Comet of 1843 is identical with Lexell's Comet of 1770? M. Le Verrier's method of treating this question possesses the following important peculiarities: first, that, taking the best modern observations of the comet, one of them is supposed liable to an error (expressed by a symbol), and the effect of this error upon the elements of the comet is retained in every following calculation; secondly, that, starting from these modern elements (in preference to the ancient ones), the path of the comet is traced backwards, and its perturbations are computed backwards, to the earlier observations. The conclusions at which M. Le Verrier arrives are, that Faye's and Lexell's Comets are not the same; and that Faye's Comet has certainly been a periodic comet at least from the year 1747, or that it had completed at least thirteen revolutions before its discovery. In a subsequent paper, the motions of De Vico's periodical Comet of 1844, August 22, are treated in a similar manner, and the conclusion is that it is probably the same as the comet of 1678.

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[*] The *plan* of this machinery is taken from that of the Earl of Rosse, but with an important modification by Mr. Lassell. In a letter just received he announces improvements which bid fair to restore the reflecting telescope to its old rank as an astronomical instrument.

While directing attention to the advance of Sidereal Astronomy during the past year, we must not omit mention of a remarkable paper by Mr. Galloway, recently published in the *Transactions of the Royal Society*, on the Proper Motion of the Solar System. This subject had been most elaborately treated by Argelander, Lundahl, and Otto Struve, by a comparison of the observed motions of stars in the northern hemisphere with their precessional motion during a long interval. The conclusion arrived at by these astronomers was, that, independently of the proper motions attributable to the stars themselves, there is also an apparent motion well recognised, arising from the set of the solar system towards a well-determined point in the heavens. Mr. Galloway thought this a subject of sufficient importance to induce an attempt at the verification of the fact by a similar discussion derived from observed motions of stars in the southern hemisphere. The ancient observations for this purpose are supplied by the catalogue of Lacaille, recently published by the British Association, and the modern from the catalogues of Johnson and Henderson. Though the observations of Lacaille are not comparable in accuracy with those of Bradley, yet the observed motions of the stars employed so far exceed the probable errors of the observations, that they afford abundantly sufficient data for the purpose. The whole number of stars selected from the catalogues of Johnson and Henderson for comparison with Lacaille is 65, and for comparison with Bradley 16, and these furnish 81 equations for the determination of the proper motion. Mr. Galloway makes no hypothesis with regard to the way in which the apparent or visible motions of the stars are

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modified by their real proper motions, nor with regard to their actual distances from the solar system; and in the latter particulars he differs both from Argelander and Otto Struve, the former of whom derives their distances from consideration of their apparent proper motions, and the latter from the consideration of their apparent magnitudes. By a rigorously precise treatment of the equations, a result is arrived at agreeing very satisfactorily with that deduced by Otto Struve for the position of the apex of the sun's proper motion, and therefore adding greatly to the certainty of the fact, and rendering it as sure as that of any of the other phenomena of astronomy.

Researches like the present, laboriously conducted by individuals, are not only honourable to their authors, but they give us the satisfactory assurance that we are prepared to take the next great step in our knowledge of the universe by vigorously applying the abundant materials which are year by year accumulated by means of the labours of our public observatories.

The theory of precession has now met with that revision, through the labours of the Struves and of Peters, that the precessional motion of stars for long intervals may be looked upon as one of our best-ascertained elements; and perhaps it would not be undesirable, for our ulterior advancement, that each published catalogue should contain a comparison of the epochal places with those derived from Bradley's and Lacaille's catalogues, or, which amounts to the same thing, that the apparent proper motion for each star should be computed on a uniform system from the best elements, as a necessary appendage to the catalogue. This would enable astronomers to deal with these residual phenomena without that previous irksome and severe labour which is at present necessary, while it would at the same time establish beyond suspicion that datum on which all other researches must altogether depend, viz. the actual amount of the observed motion.

A remarkable work on the Distribution of the Stars has been published by M. Struve, under the title of *Etudes d'Astronomie Stellaire.* The treatise bearing this name contains an epitome of the whole of the author's views upon this subject, but the details of some of the investigations are to be found in his Introduction to Weisse's catalogue. The first part of the work contains a condensed statement of the opinions of writers preceding W. Herschel (Copernicus, Galileo, Kepler, Huyghens, Wright, Kant, Lambert, Michell), bringing to the knowledge of modern astronomers a quantity of very curious literature, with which in general they are little familiar. The memoirs of Herschel are next reviewed; and the change in the views of Herschel, between the publication of the first and the last of his essays on the construction of the sidereal system, is strongly insisted on. M. Struve then proceeds to explain his own investigations; and, first, in regard to those founded upon the number of stars in Weisse's catalogue (or in Bessel's zones, of which that catalogue is the representative). Weisse's catalogue applies to a

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zone of the heavens extending from 15° south declination to 15° north declination, and crossing the milky way at an angle of about 60°. The number of stars in this catalogue, under the divisions of 1 to 6 magnitude, 7 magnitude, 8 magnitude, and 9 magnitude, have been ascertained for every hour of right ascension. But it is not possible that observations taken in the manner of those for Bessel's zones can include every star which is visible in the telescope; and attempts are made to correct these numbers in the following manner:—First, as far as Piazzi's catalogue extends (or to the 8th magnitude): the scales of magnitude having been reconciled, and the number of stars in Piazzi separated under the divisions defined by magnitude (as above mentioned) having been ascertained, and the number of these same stars included in Weisse's catalogue having been ascertained, it is assumed that the proportion of Piazzi's stars included by Weisse (for each step of magnitude and for each hour of right ascension) may fairly be taken as the proportion of all the stars in the heavens (for the same steps of magnitude and the same hours of right ascension) included by Weisse. This proportion is called the *plenitude* of the catalogue; it varies with the magnitude (being smaller for the smaller stars) and with the right ascension (being smaller where the stars are more dense). Secondly, for stars of the 9th magnitude, for which the number of stars in Piazzi is too small to justify the use of the same method. The author here remarks that, in the system of observation of Bessel's zones, the contiguous zones overlapped by a known extent, sometimes in declination, sometimes in right ascension. For these overlapping parts we have therefore tracts of the heavens which have been swept twice or oftener, and we are able to ascertain how often the same stars have been picked up in the repeated sweepings. From these numbers we can infer what is the probability that any given star will have been picked up in the zone observation: this probability is supposed to apply to all the stars which pass the telescope; and thus from the number of stars recorded as observed we deduce the number of stars which have actually passed the telescope. On collecting the numbers obtained by these two methods, it appears that for all magnitudes the stars are most frequent in the neighbourhood of $6^h\ 40^m$ and $18^h\ 40^m$ right ascension, and are least abundant for $1^h\ 30^m$ and $13^h\ 30^m$ of right ascension. This constitutes the first part of the inquiry.

The second part is founded upon the number of stars in Herschel's star-gauges. The process here is simply that of selecting the gauges which correspond to the same zone between 15° south declination and 15° north declination. Upon collecting these, it appears that the parts of greatest and least density for the stars visible only in Herschel's telescopes (or which, when most abundant, constitute the milky way) correspond precisely to the parts of greatest and least density for the stars visible to the naked eye and to smaller telescopes, although the proportion of inequality of densities is much greater. And the conclusion seems irrefragable, that the stars which we see with the naked eye are a part of the great stratum of stars which, when we see it edgeways, we distinguish as the milky way.

The author then proceeds to investigate, in an algebraical form, the law of the density of stars. Upon remarking the irregularity of the milky way, and the irregularities in the grouping of the stars generally, it will readily be seen that such a law can only be approximate, and can only apply to the mean of densities extending over a great number of similar regions. He naturally proceeds on the assumption that the law of density, if there be an approximate law, must refer to the angular distance of the stars from the general plane of the milky way (which Sir John Herschel happily denominates the Galactic Declination) as argument. Assuming, then, the pole of the galactic equator to be in $12^h\ 38^m$ right ascension and $31°\ 30'$ north declination, and selecting a great number of W. Herschel's gauges at the angular distances, 30°, 45°, 60°, 75°, 90°, from this pole, and assuming that these shall be represented by the law

$$\frac{A + B\cos 2\varphi + C\cos 4\varphi}{1 + \beta\cos 2\varphi + \gamma\cos 4\varphi}$$

where φ is the galactic declination (a law for the form of which good reasons can be given, it being remarked that any appearance which approaches to that of a stratum seen edgeways requires for its formula an expression containing $1 + \beta\cos 2\varphi +$, &c. in its denominator), the coefficients A, B, C, β, γ, are numerically determined. To this point the theory is merely an algebraical expression of the mean of observed numbers.

The next step is very important. Assuming that the distribution of stars is (roughly speaking) uniform in each plane parallel to the galactic equator, and having the algebraical law for the number of stars visible in Herschel's 20-foot telescope, and assuming also that the stars (generally speaking) are not very unequal in size, and that they can be distinguished as stars in Herschel's telescope to a certain distance and no farther, it is possible, from the algebraical law of the number of stars visible, to infer the algebraical law of the density of stars in space at any distance from the galactic equator which is less than the reach of Herschel's telescope. The law is accordingly found and numerically expressed by M. Struve; and among the remarkable conclusions is this, that the density at the distance from the plane of the galactic equator expressed by the reach of Herschel's telescope is barely $\frac{1}{200}$ of that very near to the galactic equator.

A similar process is then gone through for inferring the law of distribution from the number of stars in Weisse's catalogue (corrected, as has been stated), as far as the **7th** magnitude and as far as the 8th magnitude. To make the results comparable with the former, it is necessary to have the means of comparing the distance of stars of the 7th and 8th magnitude with the reach of Herschel's telescopes. This is done by comparing the number of stars to the

7th magnitude, of stars to the 8th magnitude, and of Herschel's stars, visible in the central parts of the milky way (a counting which requires a peculiar correction, as no great number of stars can be counted without going beyond the limits of the milky way); and then, assuming the distribution of stars close to the galactic equator to be sensibly uniform, the distance of the utmost stars of those classes will be proportional to the cube root of the number of stars. Thus it is found that the distance of stars of the 7th magnitude is about $\frac{1}{16}$, and that of stars of the 8th magnitude about $\frac{1}{10}$, of that of Herschel's extreme stars. Introducing these values into the results for density, as depending on linear distance from the galactic equator, obtained from the stars of those classes, they are found to agree well with the results obtained from Herschel's stars.

M. Struve then discusses the relative distances of stars of various magnitudes, as inferred from the number of visible stars. It will be sufficient here to cite, that the most distant stars visible to the naked eye are nearly 9 times as far off as an average star of the first magnitude, and that Herschel's most distant stars are at 228 times the same distance. From this last number most important conclusions are drawn in the next section.

That section treats of "the extinction of the light of stars in passing through the celestial spaces." It is well known that Herschel made numerous experiments on the quantity of light reflected from speculum-metal—that he also measured the pupil of the eye (which he estimated at $\frac{1}{5}$ of an inch); that from these he inferred the proportion of the light received from his reflecting telescopes to the light received by the naked eye, and that (assuming the intensity of light to diminish as the inverse square of the distance, and that the general size of the stars is uniform) he inferred that the distance of the utmost stars visible in his telescope bore to the distance of the utmost stars visible to the naked eye the proportion expressed by the square root of that proportion of lights; or that the telescope stars were 61 times as distant as the naked-eye stars. A curious correction (based on experiments) is made for this number by M. Struve, on the following grounds. The best eye cannot adapt itself to accurate vision so well as an eye armed with a telescope; and M. Struve, by the use of a telescope admitting no more light than the naked pupil would admit, found that the number of visible stars was nearly doubled. After due correction for this, it was found that the number which Herschel ought to have inferred from his photometric experiments, as expressing the proportion of the distance of his utmost telescope stars to the distance of an average star of the 1st magnitude, is 664; but the number found above, from countings of the stars, is 228. How are these two numbers to be reconciled? M. Struve considers that there is no other way than by supposing that light is extinguished in its passage, or, in other words, that the law of the diminution of light is not exactly that of the inverse square of the distance; and that thus, in the

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milky way, the telescope has shewn only $\frac{1}{25}$ part of the stars which it ought to have shewn. And he shews that the whole will be explained if we suppose that, in passing through a distance equal to that of an average star of the 1st magnitude, the loss of light is 1 per cent. From this he draws several remarkable conclusions. The reach of the 40-foot telescope is reduced from 2300 to 369. Taking the law of density of the stars (as depending on their distance from the galactic equator), as found in a former section, and combining this law of the extinction of light, he computes the brightness of the sky. He finds that, even in the centre of the milky way, supposed infinitely extended, the light of the stars beyond the reach of the 20-foot telescopes is only 12 per cent of the whole, but the light of those invisible to the naked eye is 92 per cent of the whole; that the whole light in the direction of the galactic pole is only 22 per cent of that in the middle of the milky way; that the ground of white light inseparable into stars by the naked eye, at the galactic pole, has only $\frac{1}{6}$ of the brightness of the milky way.

M. Struve concludes his work with an abstract of results obtained by Mr. Peters for the parallax of various stars. The general conclusion may be epitomised thus:—that the parallax of an average star of the 2d magnitude is $\frac{1}{10}$ of a second, and that of a star of the 1st magnitude little more than $\frac{1}{5}$ of a second. This result is then combined with others obtained by Argelander and Otto Struve, to obtain measures of the linear motion of the solar system. There are also some incidental discussions of the irregularity of proper motion, attributed by Bessel to *Sirius* and *Procyon.*

We have considered that the classical character, the ingenuity of the mathematical processes (in small details as well as in the more ostensible steps), and the importance of the results, of this remarkable treatise, deserved more than usual attention. The general character of the conclusions, we think, can scarcely be doubted, although their application must be subject to great irregularities. We conceive, for instance, that they exclude the possibility of such an annular arrangement of stars as has been depicted in some works intended to explain M. Mädler's views, detailed in the *Centralsonne.* If we might be permitted to comment on it in the way of criticism, we should remark, that the repeated assertion of the ascertained unfathomability of the heavens by the 40-foot telescope is scarcely supported by the expression of Sir W. Herschel, in the only place (we believe) where it is mentioned as probable; but the bearing of this assertion on the results of this treatise is not important.